Phenotypical Behavior and Evolutionary Slavery

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Abstract

The Prisoner Dilemma has basically two known type of evolutive answers that allow cooperation among individuals. One proposes cooperation is possible among close relatives. The other is a strategy on when to cooperate and when not to, according to the actions of the other players. An example of these strategies is playing tit-for-tat. This paper proposes a third and completely different solution to the evolutionary problem of cooperation, based on the fact that a specific gene needs not fix completely the behavior of the individual. It is a valid genetic instruction to create individuals with the same gene that have a chance of behaving one way and a chance of behaving differently, or, in other words, have different phenotypical strategies. We will see that, depending on the paremetrs of the game, there is a better genetic strategy than the previous ones mentioned above. That is done creating individuals with a phenotypical behavior to serve the other members of their species and others who will be served. This creates a type of evolutionary slavery. The species is divided into two kind of beings, called here as leaders and servants, and we show that this is evolutionary favorable to the species, as well as a stable solution. Moreover, genes playing always cooperate inside the family or even tit-for-tat are found to have no barrier against an invasion by this new strategy. It is also shown that this result does not apply only to the Prisoner Dilemma but can be generalized to other evolutionary games among individuals, as long as they have the right parameters, actually increasing the fitness of the species. Depending on the parameters of the game it is a stable and best solution to choose non-dominant strategies, different for the leaders and the servants, even when a dominant strategy is available to them. Possible applications of this strategy to problems as the appearance of multi-cellular beings and some charactstics of human behavior are proposed and shortly disccussed and it is verified that this new approach to the solution of Evolutionary Game Theory problems can lead to some very interesting consequences and explanations of known facts.

1 Introduction

A problem that has always puzzled evolutionary game theorists is the amount of observed cooperation among individuals from the same specie or even belonging to different species, even when it would be harmful for each individual to cooperate. Animals warn their companions about the approach of a predator shouting to their comrades, attracting attention to themselves and, therefore, increasing the chances that the predator will notice them and choose them as the next meal. Animals seem to help their fellows more often than it would be expected in these situations and this problem has been offered two solutions. The problem here is that, even if cooperation is the best solution for all the individuals, it is not stable in a Prisoner Dilemma circumstance. Any mutant that would decide not to cooperate would see its success increasing, as the other animals help him, but he doesn't run the risks of attracting the predators to himself by not shouting when it could.

However, the structure that really is playing these games and "learning" a way to improve its strategy, is not the individuals, who are mortal and, no matter how successful they become, will disappear. It is their genetic code that is continuously changing itself, to adapt to new circumstances or simply because it has found out a better way to do things. This idea was first proposed by Richard Dawkins [1].

Hamilton [2] proposed that, for a rare gene to survive, it would make sense to cooperate with our brothers, as they would have a 50% chance of having that same gene. The percentage would go down fast to 1/8 of chance between first cousins, so the cooperation would be something that could happen inside families, among close relatives. Our own survival would still be more important than that of our relatives, but we could warn them about danger, as long as that would make their survival, along with our own genes, much more likely. In extreme cases, like in an ant colony where all ants share exactly the same genetic code, the advantages to a gene survival gained from cooperation would be even stronger and the behavior of soldier ants, who never reproduce and die without hesitation to protect their colony would make even more sense.

Axelrod[3] suggested the second solution to the dilemma in the form of a strategy. He created several programs who would compete inside a computer, in an environment where the Prisoner Dilemma were to happen and gave it of them a strategy to try to defeat the other competing programs. He found out that the program that cooperated with programs that had previously cooperated with it and did not when in the other case would systematically win over the non-cooperating strategies. The reason for that was quite simple. When facing a non-cooperative algorithm, our algorithm would not risk itself and would not cooperate getting the best possible return. However, at least when facing copies of itself, both would cooperate, allowing for a best overall performance of the individuals.

Therefore, the theoretical possibilities for cooperation, so far, seemed to be some limited true cooperation among members of a family and the possibility of adoption of an strategy that would take us to be cooperative only when the individual we are interacting with has not failed to cooperate with us in the past. In this paper, I propose a third possible source of cooperation among individuals of a species. The key to such a cooperation is in the way that genes do influence the real behavior of one individual. So far, it has been considered in

the literature that having a specific genetic code forces you to adopt a specific strategy [4, 5].

But this doesn't have to be that way. A mutant gene could come up with instructions that a percentage of the individuals possessing it would behave in a way, while others would do it differently. There might be some sort of trigger determining which individuals will follow which strategy, like the position of the individual in some hierarchy or anything as trivial as the fact of been born during a cold or a warm day. What makes the mutation here proposed a possible winner is not how this decision is taken, although for specific problems there might be best answers, but the fact that some individuals with exactly the same code will, at some point, decide to act one way or the other.

This possibility for different behaviors associated with the same gene, or the appearance of phenotypical properties nor dictated by the gene will, as we will see, open the possibility for the appearance of individuals who exist merely to serve their peers, while the others have a more comfortable life. Therefore, the use of the name evolutionary slavery in the title of this paper.

2 The Prisoner's Dilemma and its Strategies

The Prisoner Dilemma happens in a very simple game between two players. In the example above, where an individual must decide whether or not warn its relative about the arrival of a predator, possibly calling the attention of the hunter to itself, let's say that, in average it has a chance of 10% of being killed if she and her companion cooperate, 50% if none of them does and 90% of chance of been killed to the individual who cooperates when its partner does not, while the non-cooperative specimen will always stay safe if her partner cooperates. This can be represented in a matrix form as bellow:

$$\begin{pmatrix} -0,5 & 0 \\ -0,9 & -0,1 \end{pmatrix} \tag{1}$$

There are some known good strategies, in the sense that your decision doesn't have to be never cooperate. As we mentioned those strategies are cooperate only with your very close relatives or cooperate with everybody but those who have failed to cooperate with you before. Both are good answers to the Dilemma and they can also be used together, so that you would always cooperate with someone who is a very close relative, regardless of their past actions, and cooperate with your friends as long as they cooperate with you. It is quite possible that we won't find other fixed strategies that are not variations on these two themes and that work well in an evolutionary dynamics, not leading to extinction. However, a small change in the way we look at the problem immediately opens a new possibility.

So far, we have always considered that when an individual has a specific genetic code, the strategy he will choose is already completely determined by that code, like it was set in stone. In other words, we are imposing that the strategy one adopts had a purely genetical component, leaving nothing to the phenotype. Biologists know very well that same genes can lead to different external manifestations, different phenotypes. Therefore, there is really no reason why we should assume that for a specific gene, we should have a specific strategy.

As we will see, a mutant gene that allows for different strategies associated with it could also flourish in a world where everybody else never cooperates or even in situations where everybody else is playing tit-for-tat.

Now imagine that our species is well adapted to its environment, meaning that it uses a strategy as good as everyone else. It has means to identify its close relatives reasonably well and the genes make it sure that cooperation happens in this case. Tit-for-tat may or may not be used by everybody; if it is, just assume our species does it as well. Now, a mutation occurs and we have that the new gene determines that part of the individuals who have it behave in a certain way, and the rest of the population behaves according to different rules. We are not concerned at this point with what triggers the individual decision about which behavior manifests in each case. We will return to this point later.

The two possible phenotypes for that gene differ in the strategy they assume when facing someone who will probably have the same genetic code (a close relative, something the species already knows how to recognize). When meeting strangers, they still act the same way, using the well-tested strategy their species developed. In the internal relations that lead to the Prisoner Dilemma, part of the population, that I will name as leaders, for reasons that will become clear very soon, never cooperates, while the other part, the servants, cooperate everytime. This way, a leader will always get the maximum benefit when interacting with a servant, while the servant has to support the burden of the worst result in return. The only advantage for a servant is the fact that the other servants will always cooperate with him.

For the gene, if the proportion of leaders and servants is right, the advantage obtained by the leaders is far stronger than the problems caused by their non-cooperative attitude. Against a population who never cooperates, this strategy may even improve the fitness of the servants, for the right parameters, as what they have to lose from the non-cooperation of the leaders may be compensated by the cooperation from other servants. The reason for that is quite easy to see. Suppose that half of the population of the mutant gene is consisted of leaders and the other half of servants. The interaction with individuals who do not have the gene is not altered and everybody always get a -0.5 in average, just as the non-mutants get every time. Among themselves, the servants get a 0.1 half of the time and a -0.9 the other half, for the same $-0,9$ average. If the penalty for cooperating with a non-cooperator was just a little smaller or if the result obtained for two non-cooperating individuals a little worse, the servant population would, in average, have an evolutionary advantage when compared with the non-mutant gene.

In any case, it is easy to see that the non-cooperative population has no protection at all against an invasion by this genetic strategy. For a percentage of the total population ϵ having the mutant gene, the average result for the non-mutants doesn't change from -0.5. The mutants, however, get a

$$-0.5+\frac{\epsilon^2}{8} \tag{2}$$

result, with is always better than what the non-mutant population gets, for every value of ϵ.

Let's see how this works on the general case where we have an invasion by a percentage of ϵ mutants, where there is a probability of p for a specific mutant to be a leader (and, of

course $1-p$ that he will be a servant). The Prisoner Dilemma takes here the general form

$$\begin{pmatrix} a & c \\ d & b \end{pmatrix} \tag{3}$$

where $c > b > a > d$. That is, if you don't cooperate and your opponent does, you get c and he d, if both cooperate, both get b and if none does, both get a.

In this case, we will have that a non-cooperative population would get as a result of its actions always a, no matter if they are interacting with mutants or with non-mutants. The case for the mutants, however has to be divided in two parts, the gains obtained by the leaders G_l and the gain for servants G_s. These are given by

$$\begin{aligned} G_l &= (1-\epsilon)\, a + \epsilon \left[pa + (1-p)\, c\right] \\ G_s &= (1-\epsilon)\, a + \epsilon \left[pd + (1-p)\, b\right] \end{aligned}$$

The average gain G for the gene would then be given by

$$G = pG_l + (1-p)\, G_s = a\,(1-\epsilon) + \epsilon S \tag{4}$$

where

$$S = \left[p^2\,(a+b-c-d) + p\,(c+d-2b) + b\right] \tag{5}$$

If we have no leaders ($p=0$), we have that $G = a(1-\epsilon) + b\epsilon$. That is clearly better than the result for non-mutants, a, reflecting the fact that it is always good for a gene to create cooperation within the close family, or, in other words, with itself. If that kind of cooperation were already the rule, our newly created mutant population would also be identified as family by its close relatives and the result would change to $G = b$, or no improvement at all, but no worsening, as it was obvious, as everybody is cooperating with everybody, regardless of their genetic codes.

When we have only leaders ($p = 1$), we obtain $G = a$, as nobody is cooperating. In a population where nobody cooperates, that would again mean no difference at all. If cooperation with your family is already the common strategy, we get $G = b(1-\epsilon) + a\epsilon$, which is actually worse than the result for the non-mutants. If you have only leaders and no servants, the strategy is useless, as expected.

For the appearance of some leaders to bring some advantage to the only servants case, we must see that G increases as p moves away from 0, or, in other words,

$$\left(\frac{\partial G}{\partial p}\right)_{p=0} > 0 \tag{6}$$

which means $c + d > 2b$. Therefore, we see that the strategy to acquire leaders only pays off when the average of c and d is higher than the result one gets from the cooperative strategy, what makes sense. When we have a Prisoner Dilemma where the parameters obey the $c+d > 2b$ relation, the appearance of a gene with two phenotypes, servants and leaders,

is possible. A population of non-cooperative individuals has no barrier against such an invasion.

Let's now turn to the problem of invading a population where cooperation already happens. We have seen that, in this case, an invasion by a genetic code having only leaders can not happen as the result for such genes is actually worse than for those genes that do cooperate within their families. In this case, it is just a good idea to improve the mutant strategy. If a leader can recognize who in his close family is also a leader (using any kind of cues, like smell or body posture, the details of this recognition are not important to the discussion) and who is a servant, he might decide not to cooperate only with the servants and cooperate with the other leaders inside his own family. As that changes his results from the interaction with the other leaders from a to b, that is actually an improved version that could easily replace the strategy we were discussing so far in all the events where that strategy was a winner. It is always useful for the leaders to cooperate inside their family.

In this case, we see have that

$$\begin{aligned} G_l &= (1-\epsilon)\, b + \epsilon \left[pb + (1-p)\, c\right] \\ G_s &= (1-\epsilon)\, b + \epsilon \left[pd + (1-p)\, b\right] \end{aligned}$$

and

$$G = b\,(1-\epsilon) + \epsilon S \tag{7}$$

where

$$S = \left[p^2\,(2b-c-d) + p\,(c+d-2b) + b\right] \tag{8}$$

Here, we will have that $G(p=0) = G(p=1) = b$, that is, for both a population with only leaders or only servants, the result is exactly the same as for the non-mutant population. If once more we have $c+d > 2b$, we will have that, for any p such that $0 < p < 1$ we have $G > b$. We have a maximum for G when $p = 1/2$, therefore, we see that the population will eventually mutate to a point where the numbers of leaders and servants are equal, as that point gives the highest gains.

Against a non-mutant population playing tit-for-tat, the outer strategy of the mutant gene just has to be tit-for-tat, as everybody. This way, the gene makes it sure that they keep getting cooperation from the individuals outside their family. In this case, both leaders and servants should keep playing tit-for-tat, as they did before their gene mutated. However, inside the family, we have seen that the division among leaders and servants, for the right parameters in the Prisoner Dilemma, brings a better result than simply cooperation. This way, the mutant gene can also invade an environment where everybody plays tit-for-tat and prosper there.

The equality in the number of leaders and servants means one very specific thing. That, under a Prisoner Dilemma game, it is the best genetic reply to have an equal number of individuals who increase their fitness as the number of individuals who have their fitness decreased. When the population is divided into these two groups, assymetric situations will

arise as we will disccuss in the next section and it is not clera right now if the $p = 1/2$ would be always the best reply.

3 Leaders and Servants in the General Two Players Case

The result obtained in the last section was first developed as an alternative solution to the Prisoner Dilemma, but that is not its only application. Let's examine now another type of game, one non-symmetric game with complete information, where a dominant strategy exists. Non-symmetric games can happen among members of the same species easily, specially if each member has different positions, as males and females, parents and children, or, if the leader-servant solution was developed previously, among leaders and servants. So far, it was believed that all genes should choose that strategy, as it would be silliness to do otherwise, according with traditional Evolutionary Game Theory. That is not true anymore if we introduce leaders and servants. Let's see how.

Two players, A and B, compete with each other, player A choosing the row and player B the line. Their payoffs are given by the pair

$$A = \begin{pmatrix} 2 & 10 \\ 4 & 3 \end{pmatrix} \tag{9}$$

$$B = \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix} \tag{10}$$

Here, it is clear that player B will chose the second line, as no matter what A does, it is his best solution. Knowing this, either by rational analysis, or simply observing that B always do that, A is limited to choose between second line payoff and it will clearly picks the first column, so that the total result will be, for (A,B), (4,2). We have here an average result of 3. However, were the two players to choose first line and second column, the average would go up to 5.5, thanks to very good result A would be getting. Therefore, if these numbers represent, per example, the average number of surviving offspring A and B will have, when facing this asymmetric situation, it is a good strategy for a gene make its owners to choose the first line, second column whenever faced with this decision. Again, we are supposing A and B can determine here, with reasonable success, that they share this same gene, or in other words, that they are close relatives, something we will go on assuming in this paper.

Here, if the gene of player B changes, so that he will not cooperate for A to get a better result, B will prosper initially, but, as his descendents form their own family, where the components take always the dominant strategy, they lose the advantage our mutant gene had and, as consequence, evolution works to take them out of the scenario.

The same dynamics can happen for a number of other games, including games with multiple Nash equilibria, where one of the equilibria is clearly more favorable to the gene than the other one.

A point that should be very clear is that being a leader has not necessarily anything at all to do with be the one who gives the orders or make the decisions. Being a leader, in this context, means just that other beings from your family will sacrifice their own fitness in order to increase yours. They might even be the ones responsible for the decision making and you nothing more than a reproductive machine. The point of view here is not a subjective one, but an evolutionary one, where all that matters is whether you will leave fertile children or not. Evolution is not concerned with issues like freedom or happiness, unless they would represent some change in your fitness.

4 Flexibility, Specialization and Multi-Cellular Organisms

An important genetic decision is on strategies to decide who would play the role of leader and who would be the servant. More specifically, it is interesting to ask if these positions sholud be perpetual. We can reason that it is not clear whether a leader should remain leader for his entire life as there it may happen that it is evolutive better for the roles to be traded. A gene that, once the decision about which role a individual would be playing was made, would mark the leaders as leaders for life as well as the servants would be less flexible and possibly less efficient than one that would allow a change of ranks. Flexibility seems a good idea, at first. The flexible gene has to develop a way to determine when it is convenient to change the hierarchical positions, based on the actual information the individual has access to, and, maybe, on the amount of resources already invested in the old leaders. In the extreme case, supposing a well tuned mechanism of change, the change wouldn't be necessary and this strategy would not cause any changes. Being as efficient as the non-flexible variety. In all the other occasions, the flexible gene would use its flexibility to get improved chances. In human societies, we see new leaders taking the place of old ones. That may be this effect of changing the position of leaders and servants working, or simply the rise of a new generation, as the older individuals, due to age, have their fitness decreased and it is useful for the species to put other leaders in their places.

This way of doing things should lead to change in the individual characteristics, associated with a change in the hierarchical position. This effect can be a good way to determine if the leaders are turning into servants or if they are just been replaced by new leaders. If the old leader, when demoted, loses its regal posture and seems weaker, as happens with some of them, we are actually seem his position been reverted. The opposite is hardly true. The only people who ever makeit into leader positions seem to be those who were already leaders of smaller groups. However, good fortune can change positions bringing power and/or money to a servant. In these cases, the opposite change, from servant to leader, is to be expected.

On the other hand, very rigid structures, where no changes at all are possible, allow a better specialization. A servant who is always a servant can specialize his work and get a better result for his family and genetic code, like in an ant colony. The gene could mutate to include an instruction that, if the individual is turned into a servant, his development would happen according to some blueprint; if he is a leader, his development to adulthood

is changed to fit his different hierarchical position.

If specialization wins, this can lead to the appearance of large social structures and multicelular organisms. It has already been pointed that, the fact that all the beings in a community evolving towards a single organism share the same genetic code, makes cooperation a good idea, as that gene has its survival chances improved. Here, not only cooperation happens, but some individuals use strategies athat decreases their fitness, in order to improve their leaders' fitness. In the limit situation, the servants might give up completely on having descendents of their own. The leaders make up for this by having descendents who are servants and others who are leaders, keeping the population with the same distribution as before. If the servants start contributing with very few descendants to the next generations, they soon stop having any evolutionary utility but increasing their leaders fitness.

That way, unicellular beings may have found, at some stage of their evolutions, that creating infertile descendents was a very good idea. Those beings would be programmed with some specific task, like protection, improved food gathering or anything else, whose function was to serve the ones who would be responsible for the procriation. That can lead to cells who were expert in their tasks, unable to survive on their on, but that contribute to the whole. In this sense, we could understand that the whole body of cells that make up a multicellular being are all slaves to the sexual cells, who are the ones that really make copies of themselves and of everybody else, of course. The genetic code survives and alters itself exactly by that reproduction. And, of course, the sexual cells, or leaders in the framework we developed above, want to create new servants (actually, the other parts of the body) or else they would fail in their task to get reproduced.

When the dynamics between flexibility and specialization comes to a stable solution, we have the creation of a new kind of being, a multicelular being, with no inner struggles about who should get the better fitness. The servant cell fitness can decrease to the point where they only reproduce to repair damaged tissues, and they don't even try to get an evolutionary advantage for themselves.

The same process can work with multi-cellular entities and we will have structures like ant colonies, that are actually one only being, from an evolutionary point of view. The question of why some ants work only as soldiers, never getting reproduced, living just to be sacrificed, actually does not make sense from an evolutionary point of view. Those soldiers do not reproduce, so their fitness is not an issue when determining any type of evolutionary success. During the process they when they became servants, their fitness was decreasing and becoming each time less important for the species as a whole. Therefore, it was just expected that they have turned into expendable servants.

Both forces, for flexibility and for specialization, will compete and the most apropriate structure for the situation will win. It is quite possible, from what we see in nature, that the rigidity has a tendency to win, forming new individuals, superorganisms composed of the smaller organisms working together as one. It has won in the multi-cellular case, we see very few examples of colonies of microorganisms working together, with fertile leaders and servants present. While superorganisms consisting of very specialized servants cells working to improve the fitness of a few cells are very common and are all around us, like ourselves, or every animal or plant that we find. Specialization has won among the social insects. Among

us, the struggle between the two forces still exists, but this may be just a transient phase. Only the future can tell.

5 Some Comments and Possible Applications

In this section will allow myself to speculate on the possible explanantions to natural phenomena provided by this result. I will ask the reader to forgive me if she thinks I have gone too far, my only defense is that I do believe that what I will be saying here is, if not a true description of Nature, at least, very reasonable and likely.

A first important warning is that one should be very careful when trying to identify situations where leaders and servants have appeared. This because these terms were used here in a very strict sense. Servants are not individuals who obey the leaders, but individuals who take strategies that decrease their fitness in order to increase their leader's fitness. In this sense, there are situations where leaders and servants might, according to our definition be identified in the reversed positions than leaders and servants in every day language.

We know that it can be a good decision for a gene to spend some of its carriers to further the survivability of other carriers. We have seen how this mechanism works, how it can be the right evolutionary thing to do to sacrifice some individuals for a greater "good". It can not be stressed enough that this does not mean any of us must agree with this genetic moral. The point is just that moving resources from the servants to the leaders, when facing a problem with the appropriate parameters, can be a winner evolutionary strategy. Therefore, living beings can have inside them some kind of structure that makes this type of slavery not only possible, but even desirable by the servants. This slavery is not necessarily of the type we humans are used to recognize as such, of course.

All this can lead us to some speculation on how this genetic strategy can be actually seen working in nature and in ourselves. It seems to me that much of our society could have been built around such idea. In the old days, our communities were much smaller and people from the same tribe as we were probably our relatives. Therefore, it was a good genetic strategy to divide the human society in leaders and servants and to base our decision on whether someone belonged or not to our family on the fact that they lived in the same tribe we did.

We have inherent abilities to recognize hierarchy and our position in it and we expect to be treated accordingly. When a person is low in the hierarchy (a servant) it accepts abuses it wouldn't accept if its position were higher (a leader). We have always heard that power corrupts. Well, when you are a leader, you should expect to be treated like one, that is part of the strategy. Per example, when a family has two children, the parents may decide to invest more in one of them and simply ignore the other one, if that would make the family fitness higher. The servant child will be expected to work and actually help feeding and fulfilling the needs of the leader, so that the leader child will have even better chances. More food, protection, more access to suitable members of the opposite sex.

When detecting leaders, human beings seem to use other clues than posture to determine the hierarchical position of someone. More specifically, we use clothing to represent our position and this seems to be a trace common to many cultures. Therefore, it is not so strange that people worry far more than would seem reasonable about fashion and tend

to prefer more clothing that is more expensive just because it is more expensive and not because it is better or more difficult to make. If wearing clothes is something people will use to determine if we are leaders or servants and decide whether to cooperate or not with us, it is not strange at all that people, since a very young age, seem so irrationally attracted to clothes. That can be not just a way to show to which group you belong but also a strategy to be seen as a leader.

The teenage struggles to be accepted by their peers become now even more desperate. If all of them would play tit-for-tat in their social relationships, they would not have many problems among them. But that's not the point of the game, the point is to establish oneself as leader, as someone the servants must cooperate with and not expect cooperation in return. Therefore, it is to be expected problems at some point before the adult life, some period when, if left to themselves, humans will fight each other, physically or verbally, trying by all means make themselves leaders and those they don't like servants. And we all know what happens when one is a teenager.

The same effect should be expected around organizations and this could be checked. Organizations seen as leaders, with prestige, should be able to atract workers with smaller wages for the same task than declining organizations, as people would want to be seen as leaders. It is also very interesting to see how many organizations make it a very clear point to tell people they are servants as soon as they are accepted as part of the organization. Universities, with the treatment freshmen get from their just a little older fellows, military organizations, the examples are many. Make the man know he is a servant and he will cooperate, even when the organization, or its leaders, do not.

Other area where this effect can happen is in the field of ideas and in politics. Some ideas are know to send its followers to paths that actually make their fitness lower, but the idea still flourish. A priest who is told he can't have sexual relationships, much less, children; a terrorist who dies for the cause, all have their fitness terribly diminished by these strategies. However, as we do have the ability to become servants, they can take these paths. In this case, their paths might serve somehow to further the goals of the ideas they are slaved to. But they can also serve to increase the fitness of the other member of the man's tribe, be it a rligious community or a military party.

Our leaders do think about the life of their soldiers as something expendable in order to get to their objectives. Objectives that make them more powerful, possibly allowing their genes, or the dominant genes in their country, to dominate and spread over greater areas, therefore, increasing the fitness of their own genetic code. We have a great sense of hierarchy, we are constantly gauging our position in the social hierarchy and we tend to behave according to that. Our judgement may be different from that accepted by the official society, as in the case of a mob leader, but, even there, there is a hierarchy to be respected, it is always clear who the leaders are. We instinctively tell in our body stance, in the clothes we wear, where in that hierarchy we are and that knowledge is used by everybody to decide how to behave around us.

In the old days, we would just normally meet and call friends people who belonged to our tribe and who were probably our relatives. Working with them and playing leaders and servants then was a good choice. Nowadays we carry the same genes, but most people

we meet are not family. Our systems to decide who we might expect to share a servant-leader relationship do not work as well anymore and can be exploited by our bosses, religious political leaders. It is no surprise to me that one of the most common practices in this fields is to make you feel like you are part of a family. Because people not only cooperate with their families, they also accept servant roles in that position and make sacrifices they wouldn't do otherwise.

This has other possible applications. Police officers are notoriously known, to a greater or smaller extent, in several parts of the world and/or periods of history, for abusing their functions. Political leaders have done it even worse, some considering that nothing was more important than their personal desire. In both cases, we see people in positions that give them power, using this power in a non-cooperative way, expecting that the servants would obey them. The more power given to a person, the more she requires from her followers, and the more corrupt she becomes. What could be happening here is simply the fact that this person, who learned she is the supreme leader, knows instinctively that she must not cooperate with the servants. That can be the best genetic strategy. Therefore, it is our own genes that make us corrupt as we grow more and more powerful.

It is probaably more than a coincidence that, as culture changed and we start to tell our leaders and police men that they are not the real leaders, but servants of the rest of society, their behavior changes towards a more cooperative one. They still have power and the desire to use it and become leaders but, as the society do not treat them as leaders, the problems with abuses decreases.

Turning our attention back to psychological problems, it is interesting to ask how we notice and classify who is a leader and who is a servant. Posture is a good guess as well as tips we can give with our behavior. Other subtle ways can be working as well and some research to identify them could lead to interesting discoveries.

This dynamics can be used also to explain the apparently irrational success of self-help literature and movements. If you can convince people to behave as leaders, and the world will react to that by treating them that way, it is very likely they their lives will get better, as more people start cooperating with them. The down side to it is that their improvement happens with servants sacrificing themselves for the new leaders; this way, they are not really making the world a better place, just exploring it and making sure they get their best share of it.

Aggression inside families can be a mean to determine leadership. As we have seen, it is exactly inside a family that the leader-servant strategy is expected to work best, all other cases been just weaker variations, based on erroneous instinctive methods to determine family. What we have is that violence can be a mean for the leader to establish his dominance. Servants can't be violent with their leaders, as that would make their leaders fitness worse, but, under the right circumstances, leaders could be violent and the servants would still serve them.

When someone makes himself a leader using brute force, it would be reasonable to expect that the other person would, if he were acting according to a dominant strategy for his personal interests, do something. Taking the problem to the police, changing relationships, fighting back, all are better personnal strategies than just accepting the violence. However,

when servants recognize their position as servants, their instincts are expected to work towards keeping them in that position. Therefore, it should be very hard to convince a victim of aggression to act against her aggressor, when this happens inside a family.

In the economic arena, this type of dynamics is also known to happen. Conglomerates can force their component companies to take bad individual decisions, specially when dealing with companies from the same group, so that, in the whole, the conglomerate will profit more. As long as the group ends up better, they would never care about making one of their companies worse.

6 Conclusion

We have seen that when genes are playing their games, it is not always in their best interest to play it so that the individuals playing their parts would always the problem answer with a dominant strategy. There are situations when it is genetically preferred to have individuals making decisions against their best interests, so that the whole survivability of the gene gets increased. As long as the servants have a mean to adequately determine who are the leaders with the same genes as them, they can use that information to increase the leader's fitness, even when it decreases their own. This solution is not evolutionary unstable, if the individuals adopting it belong to the same family.

The major consequences of this is that not only cooperation becomes more likely, helping to explain how it is so common in our word, but also that there will be times, even in non-symmetric games, when a dominant strategy for the gene carriers is not the best answer, from the gene point of view.

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